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EXAMINER

LAM, ANN Y

ART UNIT	PAPER NUMBER
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1641

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 09/973,629	Applicant(s) CHENG ET AL.	
	Examiner Ann Y. Lam	Art Unit 1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance, except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 79-96 and 98-110 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 79-96 and 98-110 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Upon further consideration, the finality of the previous Office action is withdrawn and prosecution is hereby re-open.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 79, 80, 82-85 and 87-94 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3,

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14-16, 23, 27, 31, 99 and 120 of copending Application No. 09/679,024 in view of Pourahmadi et al., 6,440,725.

Application No. 09/679,024, claims a chip comprising built-in structures that generate different types of physical fields to exert at least two different types of physical forces on a moiety to manipulate the moiety, wherein the physical forces are selected from electric, magnetic and acoustic forces and the built-in structures that generates the electric field comprises at least one microelectrode element.

Application No. 09/679,024 however does not disclose an integrated system comprising more than one chip, nor specifically three sets of electrodes.

However, Pourahmadi et al. teach incorporation of microfluidic chips or components into larger cartridges having any desired combination of microscale to macroscale channels, chambers, reservoirs, detection and processing regions, which makes it possible to exploit the key attributes of microfabricated chips and other miniature fluidic or analytical components in a convention, cartridge-type, physical environment, thus resolving the dilemma between large sample volumes and microfluidic structures (col. 2, lines 27-36.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the chip claimed in Application No. 09/679,024 in a cartridge as taught by Pourahmadi et al. because Pourahmadi et al. teach that such a cartridge provides the advantages of exploiting the key attributes of microfabricated chips and other miniature fluidic or analytical components in a cartridge thus resolving the dilemma between large sample volumes and microfluidic structures. The cartridge, being comprised of more than 1 chip, is

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deemed to be a chip itself, or an integrated biochip system comprising one or more chips, because it has all the structures of a chip and can be of a small scale, and a chip can be formed from separate components so long as the components are integrated into a unit.

Moreover, Pourahmadi et al. teach using two *or more* electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63). Applicants claim at least three sets of electrodes. Because Pourahmadi et al. using two *or more* electrodes for the purpose of moving molecules, it is reasonable to interpret the disclosure by Pourahmadi et al. as encompassing at least three sets of electrodes (i.e., at least six electrodes).

Alternatively, while Pourahmadi et al. teach using two or more electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63), Pourahmadi et al. do not specifically disclose using at least three sets of electrodes (i.e., at least six electrodes). However, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 IIA, citing *In re Aller*, 105 USPQ 233.) In this case, Pourahmadi et al. teach the general conditions of the claim, including the suggestion to use more than two electrodes, and moreover using three sets of electrodes is within an optimum or workable range and thus its discovery involves only routine skill in the art.

As to claims 83, 85 and 92, Application No. 09/679,024 does not specifically claim that the electric field is a traveling wave dielectrophoresis electrode array.

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However, Pourahmadi et al. teach a traveling wave dielectrophoresis electrode array for the benefit of manipulating molecules from place to place (col. 21, line 56 – col. 22, line 2.) It would have been obvious to one of ordinary skill in the art to utilize the traveling wave dielectrophoresis electrode array as the type of element for producing an electric field in Application No. 09/679,024 because Pourahmadi et al. teach that such an electrode array provides the benefit of manipulating molecules from place to place, as a specific means for manipulating a moiety claimed in Application No. 09/679,024.

As to the following claims, Pourahmadi et al. disclose the limitations as follows.

As to claim 80, the chip further comprises an acoustic element (i.e., the piezomembrane or ultrasonic horn built into the cartridge, see col. 16, line 40-53, and col. 3, lines 51-52.) The piezomembrane or ultrasonic horn is an acoustic element because it is an element that causes vibration.

As to claim 82, as indicated above, the discovery of optimum or workable number of electrodes involves only routine skill in the art. (Claim 82 is interpreted to mean that the chip further comprises at least one electrode in addition to the electrodes recited in independent claim 79, from which claim 82 depends.)

As to claims 83, 85 and 92, a traveling wave dielectrophoresis electrode array (col. 21, line 56 – col. 22, line 2) is disclosed. The Office notes that some of the electrodes of Pourahmadi et al. are considered to be part of the traveling wave dielectrophoresis electrode array and some of the electrodes of Pourahmadi et al. are considered to be part of the particle switch. Applicant has not claimed the particle switch

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in such a way that it is distinguished over the prior art. As to claim 99, the traveling wave dielectrophoresis electrode array is considered to be a layer.

As to claim 84, the chip comprises a chamber (see fig. 6 for example.)

As to claim 87, a sample applied to the biochip system can remain continuously within the system from the beginning of the first sequential task until the end of the last sequential task performed by the system. (Examiner notes that this limitation relates to intended use and that a sample in the biochip is capable of remaining continuously within the system as claimed.)

As to claim 88, the biochip system is automated (see for example, col. 18, lines 40-50.)

As to claim 89, the biochip system comprises more than one chip (col. 2, lines 27-33). The cartridge, comprised of more than 1 chip, is considered itself to be a chip because it has all the structures of a chip and can be of a small scale. That is, a chip can be formed from separate components so long as the components are integrated into a unit. Moreover, the cartridge disclosed by Pourahmadi et al. is considered to be the claimed biochip system comprising more than one chip (col. 2, lines 27-33). That is, the cartridge disclosed by Pourahmadi et al. is itself a type of chip, and it is also a biochip system comprising more than one component, each of the components itself being also chips (i.e., smaller chips).

As to claim 90, the two chips can be in fluid communication with one another (col. 2, lines 27-37, and col. 3, lines 8-21).

As to claim 91, sample components are capable of being moved from one chip to another by a mechanism other than fluid flow. It is noted that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

As to claim 93, the particle switch are connected at a common branch point, that is, where they are controlled, since they are disclosed as being controlled for causing movement of molecules (col. 21, lines 56-67).

As to claim 94, the electrodes of the particle switch are capable of being connected to out-of-phase signals.

This is a provisional obviousness-type double patenting rejection.

2. Claims 81, 86, 95, 96 and 98-110 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 14-16, 23, 27, 31, 99 and 120 of copending Application No. 09/679,024 in view of Pourahmadi et al., 6,440,725, in view of Blankenstein, 6,432,630.

Application No. 09/679,024, claims a chip comprising built-in structures that generate different types of physical fields to exert at least two different types of physical forces on a moiety to manipulate the moiety, wherein the physical forces are selected

from electric, magnetic and acoustic forces and the built-in structures that generates the electric field comprises at least one microelectrode element.

Application No. 09/679,024 however does not disclose an integrated system comprising more than one chip, nor specifically three sets of electrodes.

However, Pourahmadi et al. teach incorporation of microfluidic chips or components into larger cartridges having any desired combination of microscale to macroscale channels, chambers, reservoirs, detection and processing regions, which makes it possible to exploit the key attributes of microfabricated chips and other miniature fluidic or analytical components in a convention, cartridge-type, physical environment, thus resolving the dilemma between large sample volumes and microfluidic structures (col. 2, lines 27-36.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the chip claimed in Application No. 09/679,024 in a cartridge as taught by Pourahmadi et al. because Pourahmadi et al. teach that such a cartridge provides the advantages of exploiting the key attributes of microfabricated chips and other miniature fluidic or analytical components in a cartridge thus resolving the dilemma between large sample volumes and microfluidic structures. The cartridge, being comprised of more than 1 chip, is deemed to be a chip itself, or an integrated biochip system comprising one or more chips, because it has all the structures of a chip and can be of a small scale, and a chip can be formed from separate components so long as the components are integrated into a unit. The cartridge, being comprised of more than 1 chip, is deemed to be a chip itself, or an integrated biochip system comprising one or more chips, because it has all

the structures of a chip and can be of a small scale, and a chip can be formed from separate components so long as the components are integrated into a unit.

Moreover, Pourahmadi et al. teach using two *or more* electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63). Applicants claim at least three sets of electrodes. Because Pourahmadi et al. using two *or more* electrodes for the purpose of moving molecules, it is reasonable to interpret the disclosure by Pourahmadi et al. as encompassing at least three sets of electrodes (i.e., at least six electrodes).

Alternatively, while Pourahmadi et al. teach using two or more electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63), Pourahmadi et al. do not specifically disclose using at least three sets of electrodes (i.e., at least six electrodes). However, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 IIA, citing *In re Aller*, 105 USPQ 233.) In this case, Pourahmadi et al. teach the general conditions of the claim, including the suggestion to use more than two electrodes, and moreover using three sets of electrodes is within an optimum or workable range and thus its discovery involves only routine skill in the art.

As to claims 81, 86, 95, 102, 108 and 110, Applicants further recite an array of electromagnetic units which can move one or more sample components from one area of the chip to one other area of the chip by traveling wave magnetophoresis. Pourahmadi et al. teach applying a series of magnetic fields to the cartridge (e.g., by

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means of switchable electromagnets) to vibrate or move beads functionalized with various binding agents within the cartridge from one region to another (col. 18, lines 43-47.) As noted earlier, the movement of magnetic beads from one region to another by applying a series of magnetic fields for example, by means of switchable electromagnets, disclosed by Pourahmadi et al. (col. 18, lines 45-7), is deemed to be movement of the beads by traveling wave magnetophoresis because the series of magnetic fields disclosed by Pourahmadi et al. generates sequentially addressed magnetic fields, and generating sequentially addressed magnetic fields such that a magnetic particle transfers from one location to another is described by Applicants as producing traveling wave magnetophoresis.

However, it appears that the electromagnets are *external* to the cartridge because, in describing the movement of magnetic beads, Pourahmadi et al. teach that the "cartridge may be fabricated in such a way that specific regions or regions may interact with the external environment via magnetic forces" (col. 18, lines 40-42.) Thus, it does not appear that Pourahmadi et al. teach that the electromagnets are within the cartridge itself, or that the cartridge comprise the electromagnets.

Blankenstein however teach that magnets for producing magnetophoresis for manipulating a magnetically labeled molecule may be electromagnets that are positioned adjacent to the flow channel so that the magnetic field is substantially perpendicular to a longitudinal axis of the flow channel, and that in a preferred embodiment, the magnets are positioned in and glued to slots that are etched into a silicon chip and located adjacent to the flow channel (col. 5, line 60 – col. 6, line 4.)

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Blankenstein also disclose that the device is a micro flow system (col. 6, lines 1-6) and that the magnetic field is used for separation of macromolecules labeled with magnetic beads by magnetophoresis (col. 11, line 31 and col. 18, lines 50-59.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide electromagnets that are within a device, adjacent the flow channel, as taught by Blankenstein, in the Pourahmadi et al. device, because Blankenstein teaches that this is a preferred embodiment, allowing for the production of a magnetic field to move particles. The skilled artisan would also recognize the benefit of the convenience of providing the magnets within the device as taught by Blankenstein, as opposed to a separate element, particularly in light of the disclosure by Blankenstein that the flow chip is an important component of a portable micro system for cell sorting and analysis (col. 9, lines 3-4.)

As to the following claims, Pourahmadi et al. disclose the limitations as follows.

As to claim 96, the chip further comprises an acoustic element (i.e., the piezomembrane or ultrasonic horn built into the cartridge, see col. 16, line 40-53, and col. 3, lines 51-52.) The piezomembrane or ultrasonic horn is an acoustic element because it is an element that causes vibration.

As to claim 98, one of the multiple electrodes disclosed in column 21, line 35 – col. 22, line 2, is considered to be an electrode recited in claim 98.

As to claims 99 and 101, Pourahmadi et al. disclose a traveling wave dielectrophoresis electrode array (col. 21, line 56 – col. 22, line 2). The Office notes that some of the electrodes of Pourahmadi et al. are considered to be part of the traveling

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wave dielectrophoresis electrode array and some of the electrodes of Pourahmadi et al. are considered to be part of the particle switch. Applicant has not claimed the particle switch in such a way that it is distinguished over the prior art. As to claim 99, the traveling wave dielectrophoresis electrode array is considered to be a layer.

As to claim 100, the chip comprises a chamber (see fig. 6 for example.)

As to claim 103, a sample applied to the biochip system can remain continuously within the system from the beginning of the first sequential task until the end of the last sequential task performed by the system. (Examiner notes that this limitation relates to intended use and that a sample in the biochip is capable of remaining continuously within the system as claimed.)

As to claim 104, the biochip system is automated (see for example, col. 18, lines 40-50.)

As to claim 105, the biochip system comprises more than one chip (see col. 2, lines 27-33, disclosing incorporation of microfluidic chips or components into larger cartridges having any desired combination of microscale to macroscale channels, chambers, etc.)

As to claim 106, the two chips can be in fluid communication with one another (col. 2, lines 27-37, and col. 3, lines 8-21).

As to claim 107, sample components are capable of being moved from one chip to another by a mechanism other than fluid flow, e.g. by magnetic field (col. 18, lines 45-47.) It is noted that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to

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patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

As to claim 109, at least one of the chips (i.e., chip components of the Pourahmadi et al. cartridge) is deemed to be an active, particle switch chip (because the chip comprises electrodes and can move particles (col. 21, line 56 – col. 22, line 2)).

This is a provisional obviousness-type double patenting rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 79, 80, 82-85 and 87-94 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Pourahmadi et al., 6,440,725.

As to claim 79, Pourahmadi et al. disclose a biochip system wherein at least one of the chips (see col. 2, lines 27-33, disclosing incorporation of microfluidic chips or components into larger cartridges having any desired combination of microscale to macroscale channels, chambers, etc.; the cartridge, being comprised of more than 1 chip, is deemed to be a chip itself because it has all the structures of a chip and can be of a small scale, and a chip can be formed from separate components so long as the components are integrated into a unit)

is a multiple force chip (col. 19, lines 17-19, and col. 25, lines 45-50 and figures 6 and 7, disclosing resistive heating element 34 on the bottom surface of substrate 22, and col. 21, line 35 – col. 22, line 2, disclosing electrodes in contact with fluid for manipulation of molecules, and col. 3, lines 50-55, disclosing an ultrasonic horn built into the cartridge, wherein the cartridge may also contain a heating element for heating the fluid sample as the ultrasonic energy is applied),

wherein the multiple force chip comprises multiple functional elements in different structurally linked layers that are vertically oriented with respect to one another (the resistive heating element 34 is disclosed on the bottom surface of the substrate, below the fluid channels, and the electrodes are disclosed as being in contact with the fluid, that is, in the fluid channels, vertically oriented with the resistive heating element; or

alternatively, the heating element, which is disclosed to be preferably on the bottom wall of a chamber or bottom surface of the substrate (col. 16, lines 46-48), is considered to be vertically or capable of being vertically oriented with the ultrasonic transducer that is built into the cartridge (i.e., into another area of the cartridge), (col. 3, lines 50-52) depending on how the cartridge is positioned),

and further wherein the biochip system can perform two or more sequential tasks (heating and moving molecules), including a processing task (heating),

and further wherein the multiple force chip comprises at least one particle switch, comprising electrodes (see col. 21, line 56 – col. 22, line 2) that are independent of one another and can move particles along different pathways.

Pourahmadi et al. using two *or more* electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63). Applicants claim at least three sets of electrodes. Because Pourahmadi et al. using two *or more* electrodes for the purpose of moving molecules, it is reasonable to interpret the disclosure by Pourahmadi et al. as encompassing at least three sets of electrodes (i.e., at least six electrodes).

Alternatively, while Pourahmadi et al. teach using two or more electrodes (col. 21, line 58) for the purpose of moving molecules (col. 21, lines 60-63), Pourahmadi et al. do not specifically disclose using at least three sets of electrodes (i.e., at least six electrodes). However, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 IIA, citing *In re Aller*, 105 USPQ 233.) In this case, Pourahmadi et al. teach the general conditions of the claim, including the

suggestion to use more than two electrodes, and moreover using three sets of electrodes is within an optimum or workable range and thus its discovery involves only routine skill in the art.

Moreover, the movement of magnetic beads from one region to another by applying a series of magnetic fields for example, by means of switchable electromagnets, disclosed by Pourahmadi et al. (col. 18, lines 45-7), is deemed to be movement of the beads by traveling wave magnetophoresis because the series of magnetic fields disclosed by Pourahmadi et al. generates sequentially addressed magnetic fields, and generating sequentially addressed magnetic fields such that a magnetic particle transfers from one location to another is described by Applicants as producing traveling wave magnetophoresis.

As to claim 80, the chip further comprises an acoustic element (i.e., the piezomembrane or ultrasonic horn built into the cartridge, see col. 16, line 40-53, and col. 3, lines 51-52.) The piezomembrane or ultrasonic horn is an acoustic element because it is an element that causes vibration.

As to claim 82, as indicated above, the discovery of optimum or workable number of electrodes involves only routine skill in the art. (Claim 82 is interpreted to mean that the chip further comprises at least one electrode in addition to the electrodes recited in independent claim 79, from which claim 82 depends.)

As to claims 83, 85 and 92, a traveling wave dielectrophoresis electrode array (col. 21, line 56 – col. 22, line 2) is disclosed. The Office notes that some of the electrodes of Pourahmadi et al. are considered to be part of the traveling wave

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dielectrophoresis electrode array and some of the electrodes of Pourahmadi et al. are considered to be part of the particle switch. Applicant has not claimed the particle switch in such a way that it is distinguished over the prior art. As to claim 99, the traveling wave dielectrophoresis electrode array is considered to be a layer.

As to claim 84, the chip comprises a chamber (see fig. 6 for example.)

As to claim 87, a sample applied to the biochip system can remain continuously within the system from the beginning of the first sequential task until the end of the last sequential task performed by the system. (Examiner notes that this limitation relates to intended use and that a sample in the biochip is capable of remaining continuously within the system as claimed.)

As to claim 88, the biochip system is automated (see for example, col. 18, lines 40-50.)

As to claim 89, the biochip system comprises more than one chip (col. 2, lines 27-33). The cartridge, comprised of more than 1 chip, is considered itself to be a chip because it has all the structures of a chip and can be of a small scale. That is, a chip can be formed from separate components so long as the components are integrated into a unit. Moreover, the cartridge disclosed by Pourahmadi et al. is considered to be the claimed biochip system comprising more than one chip (col. 2, lines 27-33). That is, the cartridge disclosed by Pourahmadi et al. is itself a type of chip, and it is also a biochip system comprising more than one component, each of the components itself being also chips (i.e., smaller chips).

As to claim 90, the two chips can be in fluid communication with one another (col. 2, lines 27-37, and col. 3, lines 8-21).

As to claim 91, sample components are capable of being moved from one chip to another by a mechanism other than fluid flow. It is noted that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

As to claim 93, the particle switch are connected at a common branch point, that is, where they are controlled, since they are disclosed as being controlled for causing movement of molecules (col. 21, lines 56-67).

As to claim 94, the electrodes of the particle switch are capable of being connected to out-of-phase signals.

4. Claims 81, 86, 95, 96 and 98-110 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pourahmadi et al., 6,440,725, in view of Blankenstein, 6,432,630.

Pourahmadi et al. disclose the invention substantially as claimed (see above). As to claims 81, 86, 95, 102, 108 and 110, Applicants further recite an array of electromagnetic units which can move one or more sample components from one area of the chip to one other area of the chip by traveling wave magnetophoresis.

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Pourahmadi et al. teach applying a series of magnetic fields to the cartridge (e.g., by means of switchable electromagnets) to vibrate or move beads functionalized with various binding agents within the cartridge from one region to another (col. 18, lines 43-47.) As noted earlier, the movement of magnetic beads from one region to another by applying a series of magnetic fields for example, by means of switchable electromagnets, disclosed by Pourahmadi et al. (col. 18, lines 45-7), is deemed to be movement of the beads by traveling wave magnetophoresis because the series of magnetic fields disclosed by Pourahmadi et al. generates sequentially addressed magnetic fields, and generating sequentially addressed magnetic fields such that a magnetic particle transfers from one location to another is described by Applicants as producing traveling wave magnetophoresis.

However, it appears that the electromagnets are *external* to the cartridge because, in describing the movement of magnetic beads, Pourahmadi et al. teach that the "cartridge may be fabricated in such a way that specific regions or regions may interact with the external environment via magnetic forces" (col. 18, lines 40-42.) Thus, it does not appear that Pourahmadi et al. teach that the electromagnets are within the cartridge itself, or that the cartridge comprise the electromagnets.

Blankenstein however teach that magnets for producing magnetophoresis for manipulating a magnetically labeled molecule may be electromagnets that are positioned adjacent to the flow channel so that the magnetic field is substantially perpendicular to a longitudinal axis of the flow channel, and that in a preferred embodiment, the magnets are positioned in and glued to slots that are etched into a

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silicon chip and located adjacent to the flow channel (col. 5, line 60 – col. 6, line 4.)

Blankenstein also disclose that the device is a micro flow system (col. 6, lines 1-6) and that the magnetic field is used for separation of macromolecules labeled with magnetic beads by magnetophoresis (col. 11, line 31 and col. 18, lines 50-59.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide electromagnets that are within a device, adjacent the flow channel, as taught by Blankenstein, in the Pourahmadi et al. device, because Blankenstein teaches that this is a preferred embodiment, allowing for the production of a magnetic field to move particles. The skilled artisan would also recognize the benefit of the convenience of providing the magnets within the device as taught by Blankenstein, as opposed to a separate element, particularly in light of the disclosure by Blankenstein that the flow chip is an important component of a portable micro system for cell sorting and analysis (col. 9, lines 3-4.)

As to the following claims, Pourahmadi et al. disclose the limitations as follows.

As to claim 96, the chip further comprises an acoustic element (i.e., the piezomembrane or ultrasonic horn built into the cartridge, see col. 16, line 40-53, and col. 3, lines 51-52.) The piezomembrane or ultrasonic horn is an acoustic element because it is an element that causes vibration.

As to claim 98, one of the multiple electrodes disclosed in column 21, line 35 – col. 22, line 2, is considered to be an electrode recited in claim 98.

As to claims 99 and 101, Pourahmadi et al. disclose a traveling wave dielectrophoresis electrode array (col. 21, line 56 – col. 22, line 2). The Office notes that

some of the electrodes of Pourahmadi et al. are considered to be part of the traveling wave dielectrophoresis electrode array and some of the electrodes of Pourahmadi et al. are considered to be part of the particle switch. Applicant has not claimed the particle switch in such a way that it is distinguished over the prior art. As to claim 99, the traveling wave dielectrophoresis electrode array is considered to be a layer.

As to claim 100, the chip comprises a chamber (see fig. 6 for example.)

As to claim 103, a sample applied to the biochip system can remain continuously within the system from the beginning of the first sequential task until the end of the last sequential task performed by the system. (Examiner notes that this limitation relates to intended use and that a sample in the biochip is capable of remaining continuously within the system as claimed.)

As to claim 104, the biochip system is automated (see for example, col. 18, lines 40-50.)

As to claim 105, the biochip system comprises more than one chip (see col. 2, lines 27-33, disclosing incorporation of microfluidic chips or components into larger cartridges having any desired combination of microscale to macroscale channels, chambers, etc.)

As to claim 106, the two chips can be in fluid communication with one another (col. 2, lines 27-37, and col. 3, lines 8-21).

As to claim 107, sample components are capable of being moved from one chip to another by a mechanism other than fluid flow, e.g. by magnetic field (col. 18, lines 45-47.) It is noted that a recitation of the intended use of the claimed invention must result

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in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

As to claim 109, at least one of the chips (i.e., chip components of the Pourahmadi et al. cartridge) is deemed to be an active, particle switch chip (because the chip comprises electrodes and can move particles (col. 21, line 56 – col. 22, line 2)).

Response to Arguments

Applicants' arguments filed January 16, 2007 have been considered and are persuasive in part and not persuasive in part.

Applicants argue the invention of Pourahmadi et al. relates to a cartridge for processing relatively large volumes of fluid (abstract), and that the cartridge can comprise "any combination of microscale to macroscale channels, reservoirs, detection and processing regions. This makes it possible to exploit the key attributes of microfabricated chips and other miniature fluidic or analytical components in a conventional, cartridge-type, physical environment." Applicants thus argue that it is essential to recognize that the disclosures of Pourahmadi et al. is often describing a cartridge having multiple components, some of which may be chips. Applicants state that the different functions of the cartridge may be provided by separate elements, each of which may or may not be a chip, and certain forces acting on the cartridge are applied externally.

Examiner however emphasize that the Pourahmadi et al. cartridge, while being comprised of more than 1 chip, is considered itself to be a chip because it has all the structures of a chip and can be of a small scale. A chip can be formed from separate components so long as the components are integrated into a unit. Moreover, the abstract of Pourahmadi et al. teach processing of a fluid sample that is larger in volume than any interactive region within the cartridge (see abstract), and Pourahmadi et al. further teach that the cartridges may have any desired combination of microscale to macroscale channels, chambers, reservoirs, detection and processing regions (col. 2, lines 30-35.) The cartridge of Pourahmadi et al. is thus larger than any of its subcomponents, but the subcomponents (i.e., chips) may be in the microscale sizes and the cartridge itself thus can be of relatively small scale as desired, as suggested by Pourahmadi et al.

Applicants argue that Pourahmadi et al. do not appear to disclose or suggest a "multiple force chip" at all, which is disclosed in the present specification as one that "generates physical force fields and that has at least two different types of built-in structures" to generate those fields. Applicants point out that in the specification physical fields are described as a region of space where "forces are produced on a moiety as a result of the interaction between the moiety and the field. A moiety can be manipulated within a field via the physical forces exerted on the moiety by the field....Exemplary fields include electric, magnetic, acoustic, optical and velocity fields" (page 20, lines 18-24.) Applicants argue that a resistive heater pointed out by Examiner is disclosed or suggested by the reference a producing a physical field as that term is

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used in the present specification and claims. Applicants argue that the resistive heater of the reference appears only to control the temperature of a region, not to manipulate a moiety and the description of the resistive heaters does not disclose or suggest that they could function to manipulate a moiety. Applicants also argue that the resistive heater does not produce a field meeting the characteristics that define a physical field in the specification, which would require localized heating to produce a temperature gradient to induce a directed particle movement.

However these arguments are not persuasive because the resistive heater is disclosed by Pourahmadi et al. as being used for controlled heating which provides additional functional capabilities such as mixing, dissolution of solid reagents, lysing, thermal denaturation of proteins, elution of bound molecules, enhanced diffusion rates of molecules in a sample (col. 19, lines 40-48.) The heating thus generates a physical force field on a moiety and manipulates a moiety, and thus meets Applicants' limitation. Applicants' argument that a field meeting the characteristics that define a physical field in the specification requires localized heating to produce a temperature gradient to induce a directed particle movement is not persuasive because nothing in the specification or claims require this.

Applicants also argue that the electrodes in column 21 of the cited reference would only provide one type of physical force at most and that nothing in the cited passage describing those electrodes discloses or suggests using such electrodes in combination with a second type of physical field. This is not persuasive as the heating elements described above produce a physical field as claimed by Applicants and thus

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the cartridge disclosed by Pourahmadi et al. has components that produce two types of physical fields.

Applicants also argue that the electromagnetic element disclosed by Pourahmadi et al. is external to the device and is not built in the device. Examiner finds this to be persuasive. The new grounds for rejection cites Blankenstein, the teachings of which render obvious building into the Pourahmadi et al. device the electromagnetic element, as described more fully above.

Applicants further argue that, as to claims 80 and 96, Pourahmadi et al. do not disclose or suggest a multiple force chip, and Anderson et al. appear to disclose only the use of an acoustic force to mix materials within a chamber and do not disclose or suggest a multiple force chip using an acoustic force. Examiner notes that the Anderson et al. reference is no longer relied upon since the Pourahmadi et al. reference has been found to disclose an acoustic element built in the cartridge (i.e., the piezomembrane or ultrasonic horn built into the cartridge, see col. 16, line 40-53, and col. 3, lines 51-52.) The ultrasonic horn is disclosed as being used for ultrasonic lysing (col. 3, lines 35-39 and 50-64), and it is disclosed as being alternatively built into the cartridge (col. 3, lines 51-52), and the piezomembrane is also used for vibration and it is built into the cartridge (col. 16, lines 42-46.) The piezomembrane or ultrasonic horn is an acoustic element because it is an element that causes vibration and thus meets Applicants' limitation of an acoustic element. While Applicants' argument appear to imply that the acoustic force must mix materials in order to meet Applicants' limitation, there is no such limitations required in Applicants' claims or disclosure. In any case, the acoustic elements

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disclosed by Pourahmadi et al. are capable of mixing materials because they produce vibration of the materials (col. 16, line 43), and Pourahmadi et al. also teach that cavitation may be required for efficient lysis (col. 16, line 52-53.) Thus, Applicants' arguments are not persuasive because Pourahmadi et al. disclose an acoustic element built into the cartridge, and Pourahmadi et al. also thus teach a multiple force cartridge (deemed to be a chip) with the multiple forces being at least electric and acoustic.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ann Y. Lam whose telephone number is 571-272-0822. The examiner can normally be reached on Mon.-Fri. 10-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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